



# Finding the 'RITE' Acquisition Environment for Navy C2 Software

**12<sup>th</sup> Annual Acquisition Research Symposium**

Panel #15

In Pursuit of Agile Software Development and Testing

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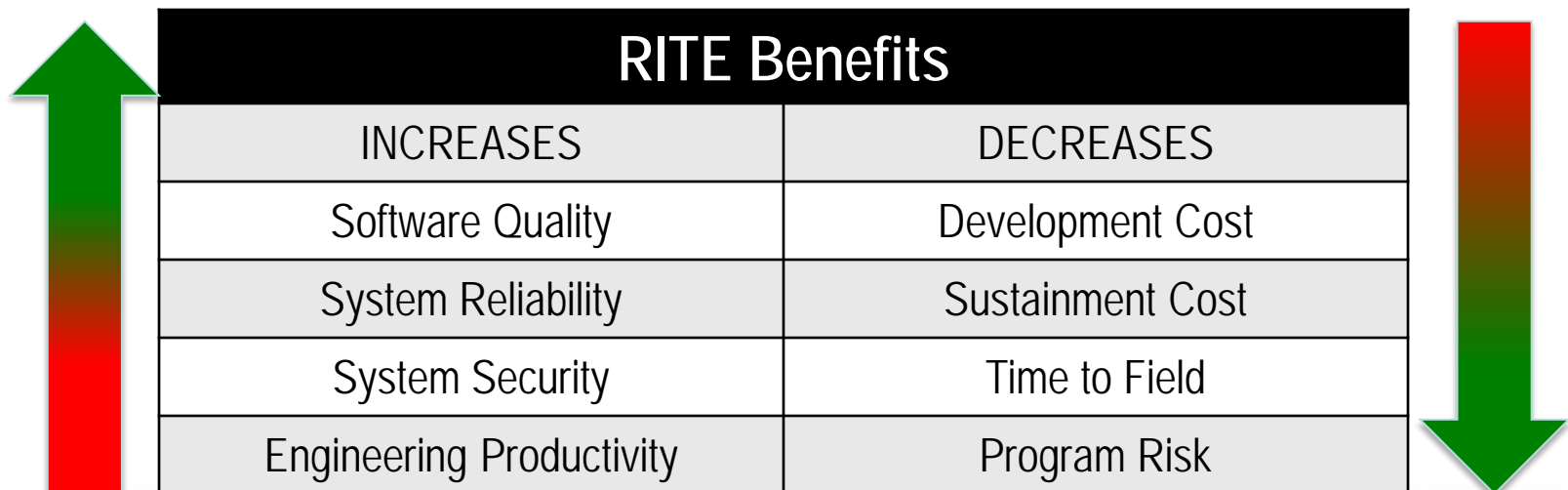
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# Rapid Integration and Test Environment

*A fundamental change in the way C4ISR software is acquired....*

- ▼ Commercial best-practice software engineering standards & processes
- ▼ Explicit governance and contractual guidance
- ▼ Automated testing and report generation tools
- ▼ Enables Agile Development and Rapid Fielding

*Provided via a Government-run development and test facility*



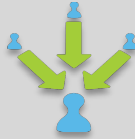
RITE Benefits	
INCREASES	DECREASES
Software Quality	Development Cost
System Reliability	Sustainment Cost
System Security	Time to Field
Engineering Productivity	Program Risk

# RITE's History

- ▼ RITE was initiated over 7 years ago as a response to program of record challenges in managing, producing and fielding C2 software
- ▼ Evolution of commercial best practices in agile development tailored to work within the DoD acquisition structure
- ▼ Key Enabler of Rapid IT acquisition programs
- ▼ RITE being leveraged by 16 software programs



# RITE's Four Pillars



## Contracts

- Boiler plate contract language - Gov purpose Rights
- Adding expectation of quality to contracting language
- Template SOW's created

## Processes

- Integrates continuous testing into Development stage
- Institutionalize source code analysis
- Automates and focuses testing
- Standardizes tools and test cases

## Infrastructure

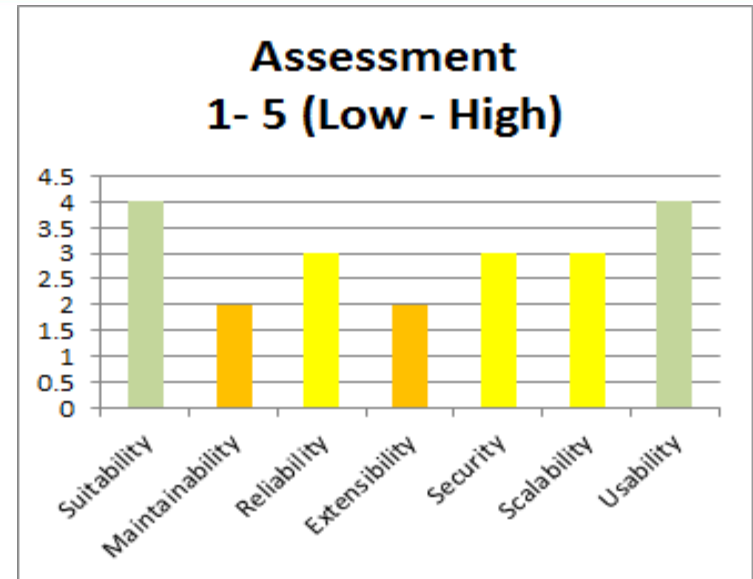
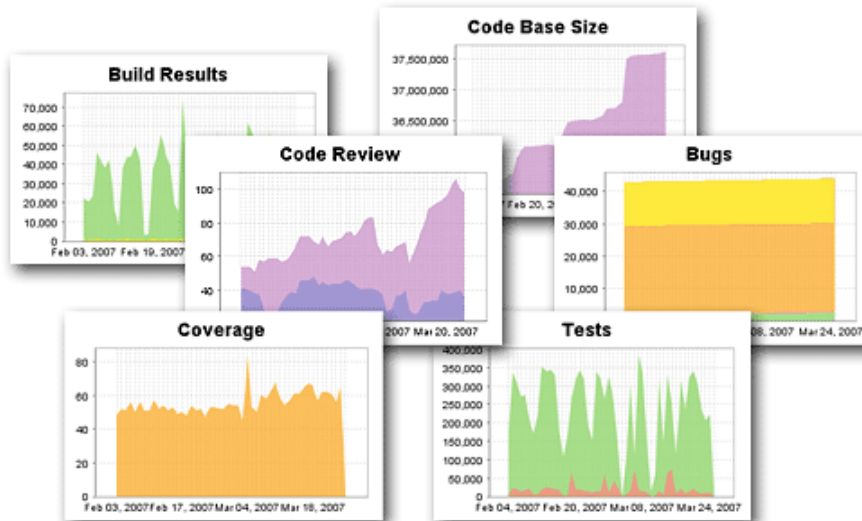
- Centralized Repository
- Enhances project comms and collaboration
- Sharable Software Testing tools and data

## Organization

- Transformation of workforce
- Software intensive training
- Government able to respond more quickly and with authority

Source Code Management

# Providing Visibility Into Production Process



## Leveraging Automation

- *Static Code Analysis*
- *Quality Code Review*
- *Code Complexity*
- *Compliance checks*
- *Automated Regression Tests*
- *Error Tracking*
- *Centralized Monitoring*

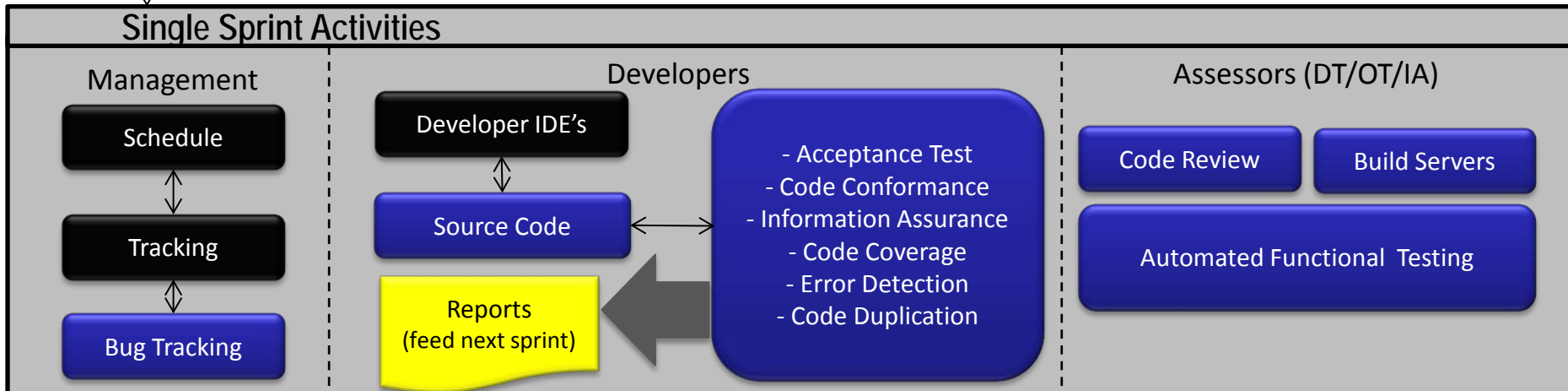
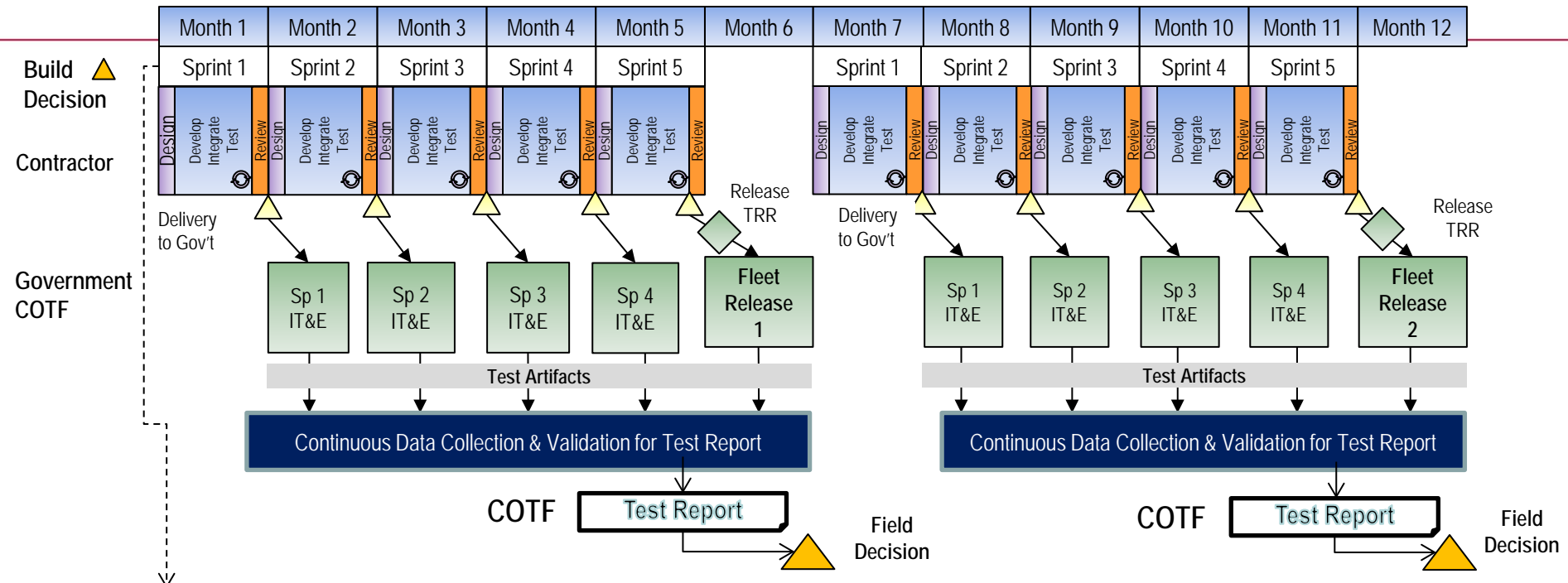
## Subject Matter Expertise

- *Program Assessment Reports*
- *Software Quality Assessment*
- *System Quality Assessment*
- *Engineering Recommendations*

# Application of RITE

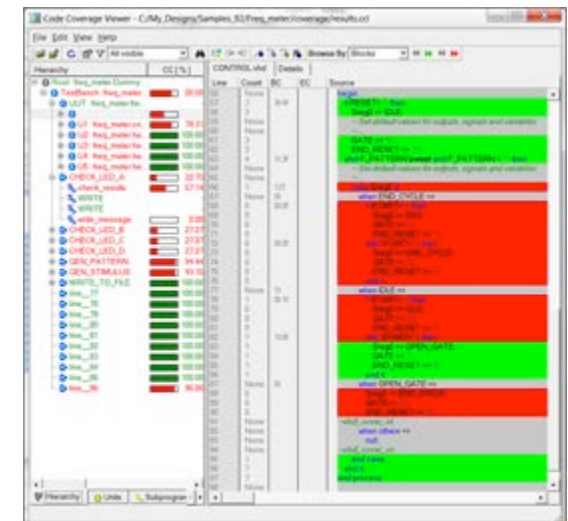


# Rapid IT Process & RITE Process





- Early address of critical issues
- Movement of critical resources to fix problem areas
- Determine quality and predict sustainment
- Ready access to health of program
- Mitigate high risk items sooner



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SW Quality Metrics: SP9

SLOC , Defects, Defect Density

SPACE AND MISSILE SYSTEMS CENTER

Sprint	Coupling Cohesion									# unused code violations									# unused code								
	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1
JVG	0	0	1	1	1	1	2	1	1	0	0	0	274	274	274	274	274	274	0.0000	0.0000	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005
Infractions	0	0	1	1	1	1	1	1	1	0	0	0	2867	2895	2905	2961	2914	2914	0.0000	0.0000	0.0008	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009
UDOR	0	0	1	1	1	1	1	1	1	415	415	415	408	508	508	508	515	515	0.0004	0.0004	0.0006	0.0006	0.0006	0.0007	0.0006	0.0008	0.0008
ASIN	0	0	1	1	1	1	1	1	1	415	415	415	408	508	508	508	515	515	0.0004	0.0004	0.0006	0.0006	0.0006	0.0007	0.0006	0.0008	0.0008
CS	0	0	1	1	1	1	1	1	1	415	415	415	408	508	508	508	515	515	0.0004	0.0004	0.0006	0.0006	0.0006	0.0007	0.0006	0.0008	0.0008
Total	0	0	1	1	1	1	2	1	1	415	415	415	2867	2895	2895	2961	2914	2914	0.0001	0.0001	0.0002	0.0002	0.0002	0.0004	0.0004	0.0004	0.0006
Total	PMD 5.0.0									PMD 5.0.0									# unused code / SLOC								

Sprint	# Software Complexity Violation									Software Complexity Density								
	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1
JVG	795	774	630	650	630	630	540	540	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	
Infractions	795	774	630	650	630	630	540	540	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	
UDOR	3845	3917	2866	2796	2796	2747	2467	2467	0.0010	0.0010	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		
ASIN	390	467	467	437	371	371	334	354	0.0004	0.0006	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	
CS	381	467	467	437	371	371	334	354	0.0004	0.0006	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	
Total	460	4158	1583	1621	1737	1768	1602	134	354	0.0004	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Total	PMD 5.0.0									# complexity violations / SLOC								

Legend	Below or Equal to Objective	> Objective and < Threshold	> Threshold
# Defect	1 per 300 SLOC	1 per 100 - 200 SLOC	Greater than 1 per 200 SLOC
Defect Density	< 0.3%	0.33% - 0.5%	> 0.5%
# Defects Removed	> 90%	80-90%	< 80%
ORE	> 90%	80-90%	< 80%
Coupling	< 2.2	2.2 - 3	> 3
Unused Code Violations	1 per 100 SLOC	2 per 100 SLOC	3 per 100 SLOC
% Unused Code	< 3%	3-5%	> 5%
Complexity	1 per 100 SLOC	1.5 per 100 SLOC	2 per 100 SLOC
Complexity Density	< 0.30%	0.30 - 30%	> 30%

# RITE Tool Suite (Evolutionary)

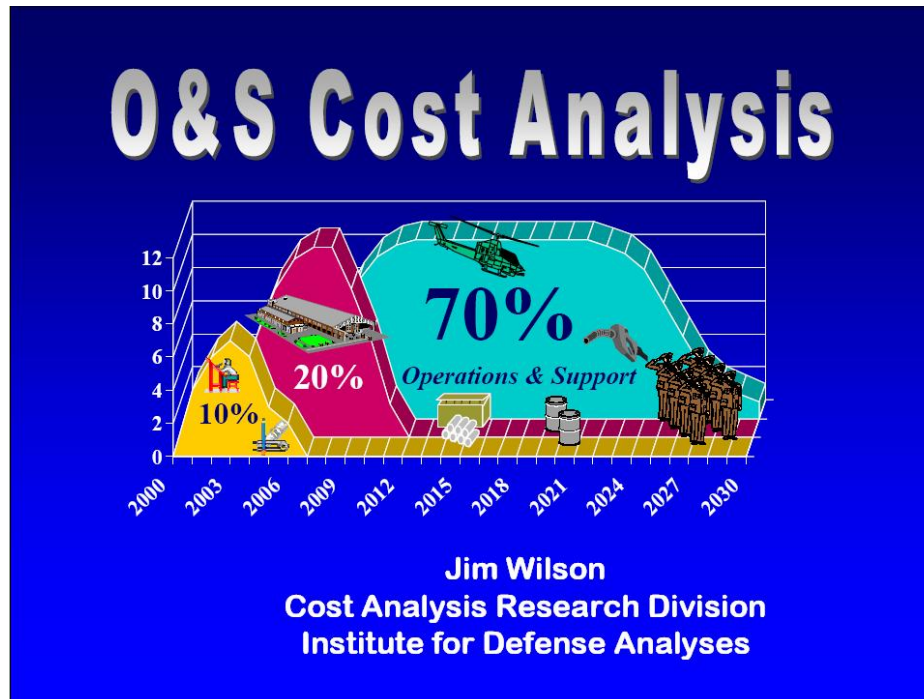
Tool	Type Tool	Measure	Category
Wiki	Agile Development Collaboration	Allows for sharing of artifacts, communication of development team	Management & Developer
JIRA	Agile Issue Tracker	Workflow and Issue tracker to conduct sprints. Plugins used to define workflow and Agile Method	
Subversion	Source Code Repository	Software Repository for Source Code Management	
Lattix	Dependency Analysis	Modularity and Complexity	Static Source Code Quality
FindBugs	Static Analysis	Defects in Java code	
PMD	Static Analysis	Programming flaws in Java, JavaScript, XML, and XSL. Cut and Paste Detector for C, C#, PHP, Python	
Klocwork	Static Analysis	C, C#, .NET Code refactoring and reliability	
Coverity	Static Analysis	Defects in C, C#, .NET and Security	
Atomiq	Static Analysis	Duplicate Code for Security/IA	
Rational Purify Suite	Dynamic Analysis	RunTime Debugger	
MCCABE IQ	Static Analysis	Cyclomatic Complexity and KSLOC. All Languages	
HP Fortify	Security Scan	STIG and Vulnerabilities	Security & IA
GSSAT (GOTS)	Security Scan	STIG and Vulnerabilities	
AutoIT	Automated Test	Scripting Engine for Automation	Functional Testing
TestComplete	Automated Test	Automation Orchestration Suite	
ATRT	Automated Test	Interface Testing and Data Producer	

# RITE enables Critical Bug Finds

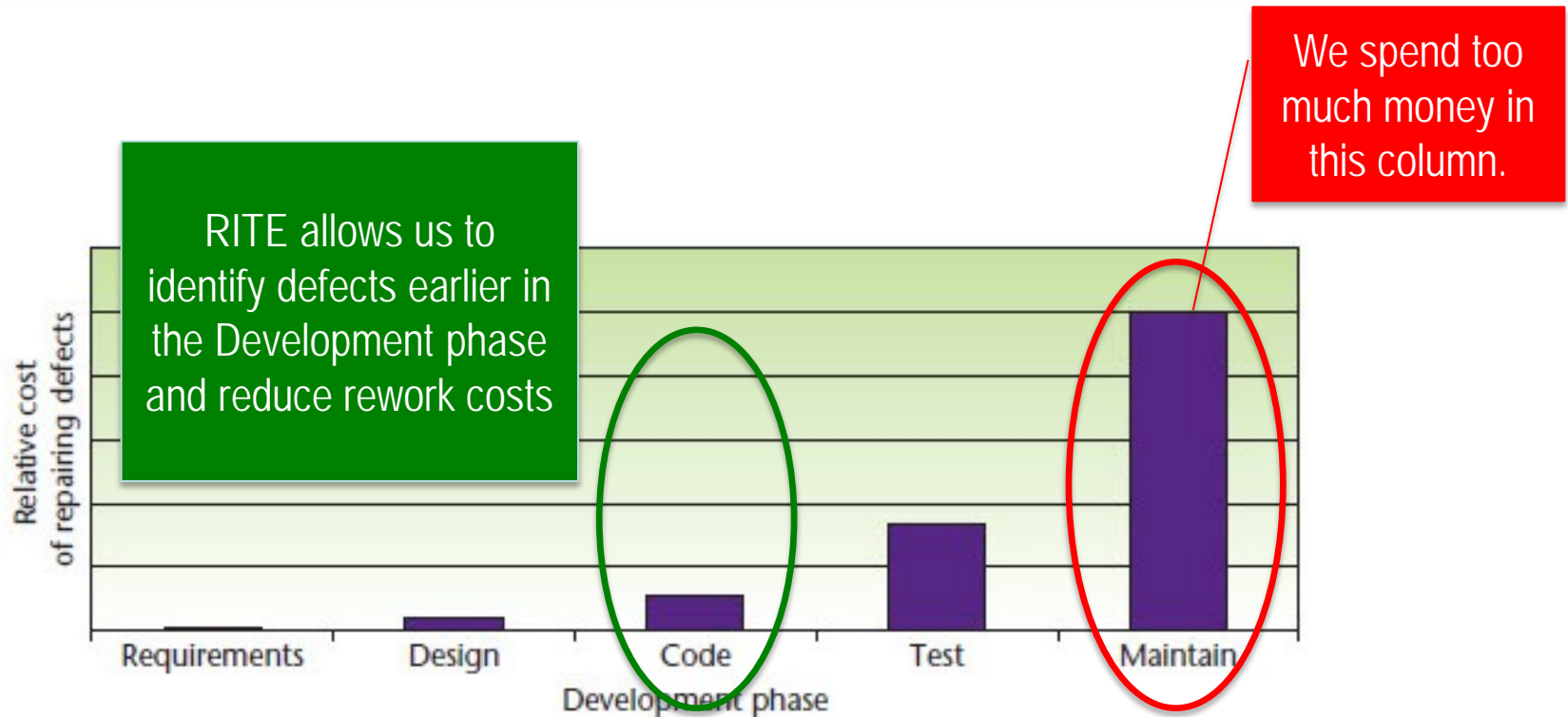
Cost  
Savings

Program  
Risk

- ▼ Early software assessments and automated testing provided for Identification of over 100 “Critical” Software bugs up to 8 months earlier than expected
  - Detection during development integration cycle vs Major Development Test



# RITE Benefit



**Today...**

# Storefront/Tactical Marketplace

## ▼ Storefront Benefits:

- Speed to Capability: Enables rapid fielding of capabilities to the warfighter by automating the distribution, updating, and installation of components
- Simplified User Experience: Provides a common presentation, distribution, update, and installation service for all PoRs
- Driving Down Cost: Reduces fielding and deployment costs

# Storefront/Tactical Marketplace Initiatives

- ▼ SSC-PAC is establishing a Navy App Store ecosystem (systems, processes, guidance, etc.) to enable accelerated fielding of new capabilities to the warfighter at the tactical edge
- ▼ SSC-PAC has an open dialogue across the DoD Storefront stakeholders:
  - DoD policy working group aligning the Widget technologies across the enterprise (DoD Widget Working Group)
  - Member of the Ozone Widget Government Open Source Software (OWF GOSS)
  - Technical Exchange Meetings with other Storefront efforts:
    - JC2CUI - DISA PEO C2C / GCCS-J Application Store, DI2E Storefront, PEO C4I Storefront

# Notional OV-1 Tactical Storefront

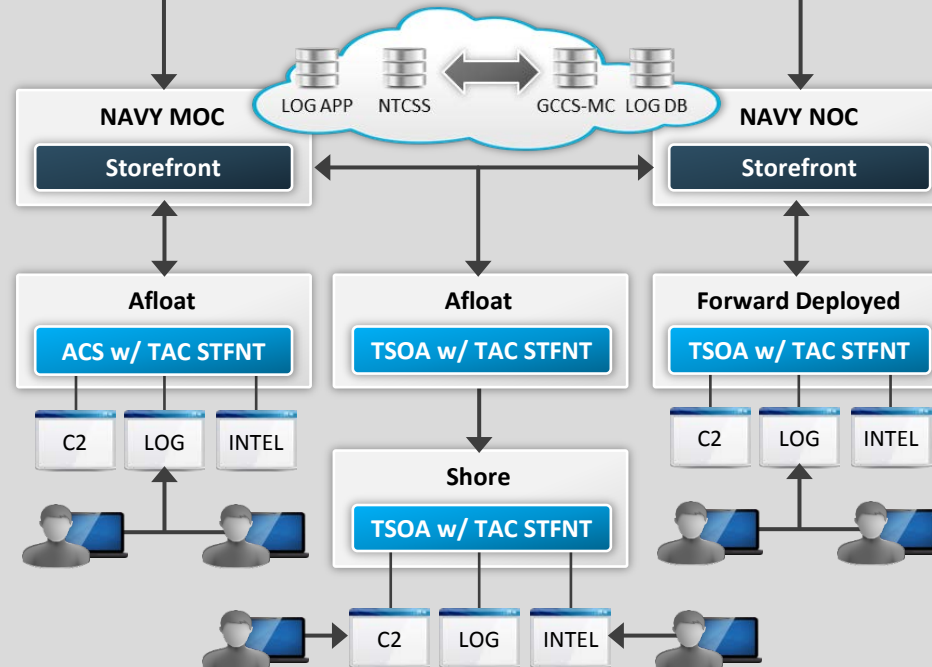
Agile Development



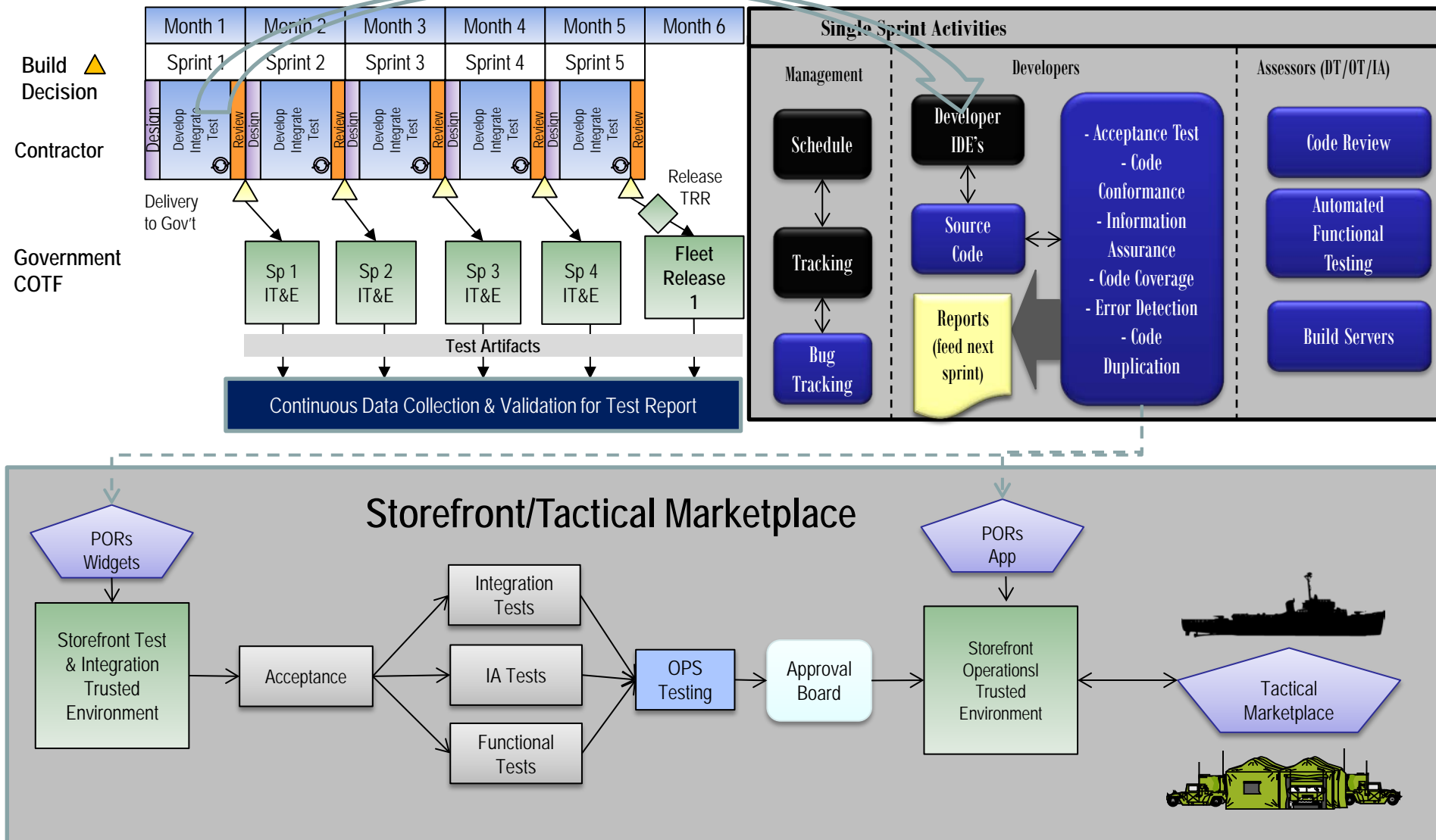
Test & Approval



Ashore & Tactical Storefront



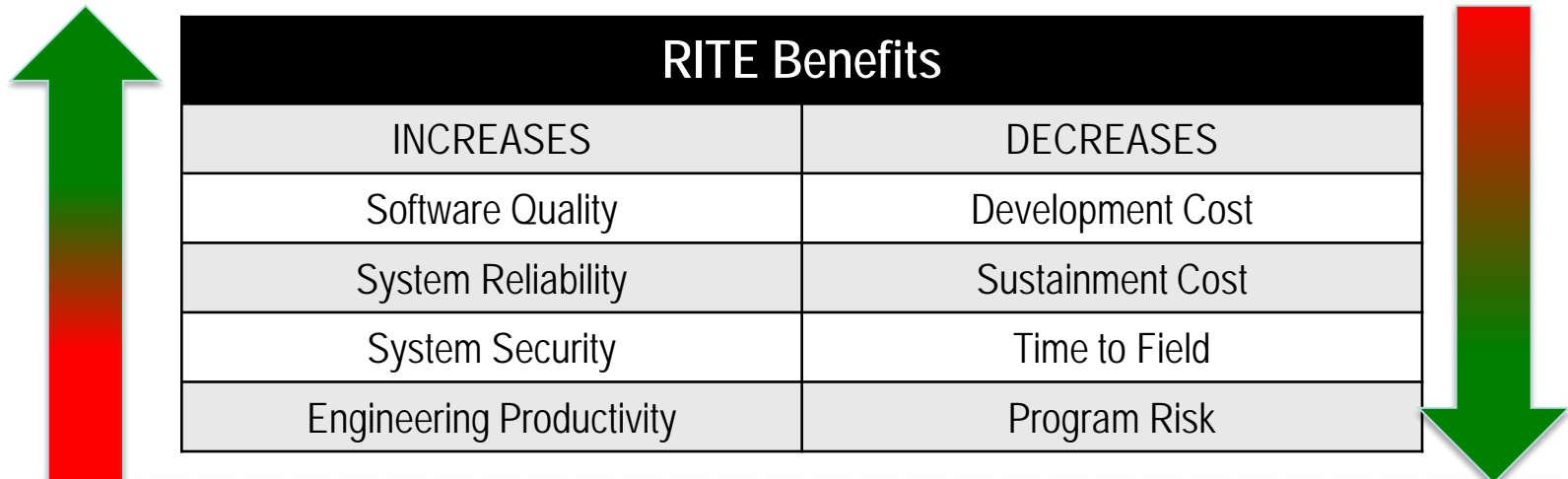
# Rapid IT & RITE Process Using Storefront/Tactical Marketplace





# Summary

- ▼ Program visibility into production
- ▼ Rapid IT and RITE process alignment
- ▼ Metrics to drive quality
- ▼ Better productivity
- ▼ Tools to assess risk and quality
- ▼ Cost savings



RITE Benefits	
INCREASES	DECREASES
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# Questions?

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